CONTRIBUTIONS TO MORBID ANATOMY,
No. IV.

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Empyema and Pneumothoraæ.

THE diagnosis of breast complaints has been in recent times greatly extended, chiefly by the labours of Auenbrugger, Corvisart, and Laennec, although many others, following the example of these able professors, have confirmed most of their observations, added a few, and modified others. In the present communication, however, it is my intention to confine myself almost entirely to the results of my own experience. I have had several opportunities of observing empyema and pneumothorax, both before and since M. Laennec wrote; and in revising these cases for publication, I have felt an interest in tracing the progress of my own knowledge, which I hope may be deemed pardonable, and even prove instructive to others.

In every case in which air, whatever its chemical constitution may be, is contained between the pleura pulmonalis and pleura costalis, the disease is *Pneumothoraæ;* whenever a purulent fluid is in the same situation, the disease is *Empyema.* These affections may occur separately, but are frequently conjoined.

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* See Professor Gmelin's Experiments in this Journal, xxvi. 133.

They are recognized during the lifetime of the patients by the common symptoms; or by the more recent methods of investigating pulmonary diseases, by percussion and the stethoscope. It is after their presence has been suggested by the former that we have recourse to the latter for the purpose of acquiring certainty. These never leave the diagnosis doubtful when they are employed; but the unexpected discovery after death of the existence of these diseases in some cases when they were not suspected proves that the common signs are occasionally fallacious. In this country I was one of the first, if not the first, who made use of percussion and the stethoscope as means of diagnosis. Although at first they were employed imperfectly from want of knowledge, I persevered, notwithstanding the ridicule and sneers of the ignorant and prejudiced; because what was said of these methods of acquiring knowledge of internal disease was reasonable, and it was said by men of whose truth and accuracy of observation on other points I was completely convinced. I have now the satisfaction to see that they are duly appreciated by the whole profession, even by those who at first opposed them.

As, in my opinion, pneumothorax is commonly a consequence of empyema, or is preceded by it, I shall first give an account of the cases of the latter which have occurred in my own practice, although some of them were very imperfectly observed, from their occurring when the nature of the disease was not well understood.

Case I.—*Simple Empyema of the right side.*

Many years ago I had an opportunity of examining a case of empyema, which was remarkable for the enormous quantity of purulent matter contained in the right cavity of the thorax, and for the apparent total destruction of the lung of that side.

A woman somewhat advanced in life presented herself at the Royal Public Dispensary of this place with symptoms which were at the time considered to indicate the presence of hydrothorax. After a few weekly visits she discontinued her attendance. Some months afterwards her husband came to inform me that she was dead, and that she desired him to request me to open her body, as she was sure something extraordinary would be discovered. On inspecting the body as it lay on the table, its external form was not symmetrical, and the right side of the thorax and right hypochondrium were evidently more prominent than the left. My friend Mr Wishart performed the dissection, and when removing the skin and pectoral muscles, a gush of fluid took place, in consequence of the pleura and intercostal muscles being thrust out between the ribs on the right side. The thorax was then opened as quickly as possible, and the right cavity of the

pleura apparently contained nothing but purulent matter. Its quantity was so great as to fill several wash-hand basins, and upon removing it entirely the size of the cavity was truly extraordinary, in consequence of the diaphragm of that side being thrust down into the abdomen, and rendered concave towards the thorax, while the mediastinum was forced over towards the left side. We did not discover any remains of the right lung; and I must confess that at the time I thought it had been entirely destroyed by suppuration. On reflection, however, I soon became satisfied that this could not be the case, otherwise the roots of the large branches of the bronchial tubes must have allowed the purulent matter to escape by the trachea, and prevented the possibility of its enormous accumulation, and fatal hæmorrhagy must have ensued from the trunks of the blood-vessels long before the whole lung could have been consumed. I had therefore no doubt that the lung must have been condensed and compressed towards the mediastinum so as to escape observation. The accuracy of this conclusion was established by future examinations.

Case II.—*Empyema of the right side.*

The next case I have to narrate occurred in the hospital, and was more accurately observed.

Mark Young, aged 33, a servant, was a patient of the clinical ward of the Royal Infirmary when I took charge of it on the 1st February 1815. He had been a patient of Dr Home, who had considered him as labouring under hydrothorax; but for some time before he came under my care, painful micturition was his principal complaint, and he had few symptoms which could indicate the presence of any thoracic affection. The case on the 1st February was entered in the Journal in the following words: "Complains of severe pain of the urethra, especially about the external orifice, in the lips of which a slight degree of inflammation is observed. The pain is particularly distressing immediately before and after making urine, to which he has very frequent calls. Complains also of difficulty of breathing on going up any ascent, and is subject sometimes to a fluttering in the region of the heart, chiefly a short time after lying down in bed. He feels a slight pain on pressure in the epigastrium, and in the hypogastrium, which last is more severe when the bladder is distended. Pulse 90; heat natural; tongue clean; some thirst; appetite pretty good; bowels have been opened with castor oil; sleep much disturbed by micturition. The micturition and pain of the urethra began about four months ago, which he attributes to his having retained his urine too long. The difficulty of breathing began

about five years ago after an inflammatory affection. Has used since he came into the hospital the warm bath, electuary of sulphur and squill pills, from which last he thinks he has derived some benefit."

He made so little complaint of his pectoral affections, and was so much distressed with the disease of his urinary organs, that my whole attention was directed towards relieving them, but without success. On the 13th of April the report is pretty full, and states that, " when he has been lying quiet he has much less pain in making water than formerly, and voids more at a time ; but if he is moving about, or after having a stool, or passing flatus, the pain is increased. For some time he has had some cough and expectoration, which is rather difficult. The acidity of stomach is considerably relieved, but recurs occasionally as well as flatulence. His appetite is entirely gone, and he is greatly emaciated. He sleeps tolerably, and his bowels are costive, having required fifteen pills to open them yesterday. Pulse 146, small, but sharp." He now expressed a wish to leave the hospital. It was found, however, that he was quite unable to bear the fatigue of being removed. He became much distressed with acidity, flatulence, and retching. His urinary complaints were if possible aggravated. He passed a disturbed night, unable to rest in any one position, with a constant desire to make water, but voiding scarcely a drop or two at a time, and he died in the course of next day. The examination of the body was very minute, and proved highly interesting. The dissection was performed, and the appearances described by the late Dr John Gordon, and is interesting on account of the morbid appearances observed in the urinary organs as well as in the lungs.

In the chest.—On removing the sternum the pleura costalis of the *right side* was found much more thick than natural, and apparently possessed of unusual vascularity of its inner surface ; the right cavity of the chest contained 130 ounces of fluid, which at first sight seemed to resemble the serum of the blood, only somewhat more opaque, but on its being agitated it very nearly resembled cream, on account of the admixture of a thicker and heavier fluid which had fallen to the bottom.

There were also found adhering to the sides of the cavity, masses of a curdy or flaky matter of different sizes, the largest about the length and half the width of the hand, in contact with the diaphragm.

The lung of this side was pressed by the fluid to the upper and posterior part, lined by the pleura pulmonalis, which, as well as the lung itself, seemed externally quite healthy, excepting in size, being only about one-eighth of what is usual,

or a little larger than the fist. On making a section through it, its internal structure was found nearly natural. At the superior part of the upper lobe, however, an abscess had formed about the size of a large plum, containing purulent matter; it adhered also very firmly to the mediastinum and upper parietes of the chest, and the ramifications of the bronchia were more contorted than usual. On the *left side* the lung behind the cartilage of the ribs was covered with a gelatinous effusion, and adhered firmly to the ribs, mediastinum, and diaphragm; the external appearance was otherwise healthy. On making a section into it, small abscesses were found distributed through every part, and the branches of the bronchia contained a considerable quantity of pus. There had been no effusion into the left cavity of the chest, and the lung was of natural size.

The *pericardium* and heart were quite healthy, except that the cavity of the former contained about ℥iii. of a clear yellow fluid.

Abdomen.—The *liver* was found adhering to the diaphragm, and its external surface was of a colour much paler than common. Its structure appeared healthy in every way, excepting in colour, which resembled the external surface.

The *gall bladder* contained a small quantity of pale yellow *bile*. The *spleen* was quite natural.

The *stomach* without any mark of disease, as also the *intestines* generally; but a few parts seemed to possess more than usual vascularity, and were somewhat livid. The *colon and rectum* were very contracted, being not so large as the *small intestines*.

The *glands* of the *mesentery* were many of them enlarged to about the size of a small bean.

The left *kidney* and *ureter*, in every respect perfectly free from disease, as was also the cortical substance of the right kidney, and the greater part of the medullary; but the projecting papillæ, called the processus mamillares, were in an ulcerated state, and their membranous coverings, the infundibula, nearly destroyed. The pelvis was enlarged and filled with a granular matter, resembling particles of inspissated pus, mixed with some pus in a fluid state. The ureter at its commencement was found much dilated, being about the diameter of the little finger, and throughout its whole extent three times its usual size.

The inner coat of the *bladder* was universally inflamed, and extremely vascular. In some parts the vessels were observed beautifully branching off from a common trunk in an arborescent form. In many parts this coat was ulcerated, and in some perfectly destroyed. The ulcerations were irregular, and run-

ning into each other, resembling a substance moth-eaten. More were observed in the fore part and fundus than on the back part and neck. The entrance of the left ureter was quite natural, excepting the general inflammation; but that of the right was in an ulcerated and thickened state.

The prostate gland without any obvious disease; as also the urethra so far as it was examined.

This man therefore suffered under two distinct affections, disease of the urinary organs and empyema, and I have little doubt that his death was to be ascribed to the former affection only, and that his emaciation and fever proceeded entirely from irritation and want of sleep. Indeed, it was remarkable how little he suffered from the presence of so great a quantity of fluid in the cavity of the pleura. After he came under my care he had no remarkable dyspnœa. His face had neither a leucophlegmatic paleness nor a bloated flush. His feet did not swell. He could lie on his back or on either side. He did not start from his sleep, and for a long time he made no complaint of palpitation, nor was there any sense of fluctuation in the chest observed. There can, I think, be no doubt that this was a case of purulent secretion from the pleura, which had probably been actively inflamed five years before the death of the patient, and that the termination of the acute disease had taken place by effusion instead of adhesion. Notwithstanding the lung was compressed into a very small proportion of its natural volume, it had not much appearance of condensation, but was generally spongy, and it floated as usual when thrown into water. My lamented friend Mr Schetky made on the spot a painting from the divided lung, which exhibits well the thickening of the pleura and inflammation of the bronchial tubes.

Case III.—*Empyema of the left side.*

The history was drawn up with great minuteness and accuracy by my promising but now deceased pupil Dr John Lane of Cork; and for some additions to the Journal report of the appearances discovered on dissection, I am indebted to my friend Dr Craigie, who carefully examined the parts after they were removed from the body.

"November 12, 1820.—Rebecca Neilson, æt. 25, married. Complains of oppression and great difficulty of breathing, of a frequent cough, attended with a free expectoration of a thick purulent-like matter, and of palpitation confined to the epigastrium and that part of the chest lying behind and beneath the *right* mamma. These symptoms are all increased on the slightest motion. She can lie only on the left side, and she cannot take a full inspiration. The right side of the thorax is very sonorous, and by means of the stethoscope the air is distinctly

heard penetrating the air cells. (puerile.) But the left side gives on percussion a dull sound and an obscure sense of fluctuation. The entrance of the air into the lungs on this side is indistinctly heard in all parts, a little more distinctly along the side of the dorsal vertebræ, and above and beneath the clavicle. The action of the heart is faintly heard in the præcordial region, but is very evident in the right side of the sternum. The centre of this action corresponds with the cartilage of the fifth rib. On the upper and inner part of the left breast there is a circumscribed hardness of about two inches in diameter, the centre of which is soft, and gives an emphysematous sensation to the finger. This tumour is unattended with soreness, but pressure excites coughing, and causes to the patient the sensation of a fluid rising in the trachea.

" Has occasional chills, chiefly after taking cold drink. Has slight œdema and coldness of her feet and hands, and the integuments of the left eye are œdematous ; respiration hurried ; pulse 108, very small ; heat lower in the left axilla than the right ; tongue moist ; much thirst, and little appetite ; bowels open from medicine. Catamenia appeared last about four months ago, and were then preceded by hysteric fits.

" Reports that about two years ago was affected with cough, which was soon removed by quack remedies. Was afterwards subject to slight palpitation and hurried respiration on taking exercise. In April she received a blow of a chair on the lower part of the left side of the chest, which was followed by inward soreness, heat, and severe pain of that side, which continued till about three weeks ago, when the tumour on the breast was first observed. In June she had occasional chills, dry cough, and the soreness was aggravated. One night in particular it became very severe, and after drinking some rum-punch she felt a sudden snap, as if some part had given way within the chest, and immediately she threw up about a pint of yellow matter, said to be purulent. The pain afterwards abated, and she expectorated for some days a large quantity of similar matter, having an offensive smell. In the month of July she slept in a damp bed, and a rash, which was then present, disappeared. Soon after this the symptoms of her present complaints came on, which have since been gradually increasing, till her admission into the hospital in November under Dr Spens's care. These few last days her pectoral affection has been somewhat easier. About four months ago all objects appeared to her disfigured and larger than natural. This deception lasted for three weeks ; and she says that on one evening her child seemed so terrific as to induce her to throw a knife at it. States that about a month ago she perceived a fluctuating sensation in her chest, which was audible to bystanders.

" She has used some medicines before admission, and has repeatedly blistered her side without relief; and under Dr Spens she has used diuretics with slight amendment "

After she came under my care she had cough in the morning, with copious purulent expectoration ; difficulty of breathing considerably easier, when lying on the left side, but aggravated when lying on the back, at which time she cannot speak ; and when turned on the right side her breathing immediately became laborious, cough was excited, and her face became purple. On the 16th the palpitation was not so distressing, and the pulsation not so high up in the chest. Soon afterwards her expectoration became suppressed, she had colliquative diarrhœa, some slight delirium, and she died on the 24th. The body was examined next day.

In order that the displacement of the heart might be more accurately observed, the right side of the chest was first exposed, by cutting through the cartilages, and then sawing through the ribs of the same side at their lateral angles, and thus removing a portion of the parietes of the right side, while the sternum was left *in situ.* The lungs of this side, which filled the cavity collapsed, and part of the pericardium distended with fluid, was seen situate considerably to the right of the sternum. For a drawing of these parts in their relative position, in this stage of the dissection, I am indebted to Mr Benjamin Bell, Fellow of the Royal College of Surgeons, then my pupil.

The muscles of the left side of the thorax, on which she constantly lay, appeared paler than natural. Underneath, where the emphysematous tumour was felt, there was no loss of bone, but the intercostal muscles and pleura at that part were ulcerated away, making a free communication between the external tumour and the cavity of the chest.

On puncturing the thorax on the left side, between the fifth and sixth ribs, some pus flowed out, but there was no escape of air, nor was any contained in this cavity.

When the sternum and cartilages were completely detached, and the left thoracic cavity was exposed, it presented from nearly the lower margin of the third rib to the eighth or ninth a complete sac of purulent matter, cream-coloured, pretty consistent, and having at first sight the appearance of what is termed an abscess of the lungs. When, however, the purulent matter, amounting to about four pounds, was removed it was shown to be otherwise. Above, corresponding nearly to the third rib, a membraneous adhesion, thick and firm, extended from the pulmonary to the costal pleura, and thus formed the upper wall of the purulent cavity. The lower part or boundary of this cavity was formed by a short membraneous adhe-

sion, passing from the lower margin of the left lung to the costal pleura near the eighth or ninth rib. Between these limits the pulmonary pleura was covered with a layer of coagulable lymph, irregular on the surface, with fibrous or cordy ridges, and varying in thickness, being in some places as thin as a shilling, in others as thick as a penny-piece. The costal pleura was in like manner covered with an irregular layer of the same kind; and at the back of the lung, near its root, large masses of lymph, some soft and easily torn, others firmer, like cross bands, passed between the pulmonary and costal pleura. The lymph with which the pleura was covered could be detached in many parts, and showed the membrane below, in general not much changed, unless rather more vascular and less transparent than natural. The left lung not above the size of the natural spleen, for the whole of this space was forced towards the mediastinum, with which it was connected by adhesions as hard as cartilage. The anterior mediastinum was forced sensibly to the right side. The alteration of the situation of the heart was again observed. Instead of being found on the left side, lying obliquely between the mediastinum and the cardiac notch of the left lung, it had been not only thrust below the sternum, so as to be nearly straight, but likewise projected considerably into the right side of the chest.

The whole left lung, and particularly the inflamed surface of the pulmonary pleura was examined, for the purpose of knowing whether any passage existed between the cavity and the substance of the lung or bronchial tubes, and after some time spent in inspection none was discovered. Convinced, however, from the symptoms during life, that some such passage must have existed, Dr Craigie traced the whole surface repeatedly, and by removing the lymph by a blunt probe, at length discovered a small orifice, about the size of a goose quill, which extended about $1\frac{1}{4}$ or $1\frac{1}{2}$ inch through the substance of the lung, and terminated distinctly in a pretty large bronchial tube. The reason of the difficulty of discovering this aperture was, that its margins were obliquely compressed against each other, and the opening thus diminished blocked up with a portion of lymph or morbid mucus, and that the surrounding pulmonic tissue was so much compressed as very nearly or altogether to obliterate the passage. When cut open by the scissors its surface was smooth and villous, like that of a common fistulous sore, but without that uneven appearance which distinguishes recent ulceration.

The portion of the left lung above the upper adhesion, though connected to the costal pleura by one or two slips of false membrane, was pretty sound; the remainder was compressed, felt firm, and sunk in water.

In the superior part of the right lung some tubercles were found in a state of suppuration; otherwise it was natural.

The pericardium contained about two ounces of the usual fluid; the heart was rather enlarged; the right auricle and ventricle contained a good deal of black clotted blood, but was in every other respect healthy.

No morbid appearances were discovered in the abdomen.

This woman's thorax was not symmetrical; the diseased side was contracted or diminished in front, and enlarged behind; the ribs of the diseased side were more curved backwards, as they arose from the spine, and flatter as they joined the sternum than those of the sound side, while the spine itself was bent a little towards the right or sound side, being the reverse of Laennec's *rétrécissement du coté*, although the want of symmetry was similar. But it must be remembered that Mrs Neilson's left side was distended to the utmost with pus, whereas Laennec's description and figure apply to the state of the parts after the cause of distension has been removed, and the diseased side gets contracted.

According to the appearances discovered on dissection, this was an example of simple empyema of the left side uncomplicated with pneumothorax; but it may be doubted whether this had always been the case. The woman herself stated, that, about a month before she was admitted, "she perceived a distinct fluctuation in her chest, which was audible to bystanders." Now this audible fluctuation, according to the authority of Laennec, confirmed by the experience of myself and others, as well as by experiment, cannot take place unless both fluid and air are contained in the same cavity. Also in the notes for a clinical lecture which I delivered upon this woman's case before her death, I mention, "I have noticed, by the stethoscope, under the sternum, a singular sound, which I cannot compare to any thing more accurately than to the fall of a heavy drop of water. This was not repeated oftener than once in every two or three respirations. At another time it more resembled the sudden separation of moist surfaces, as in the smacking of the lips." At the time I was not acquainted with the *tintement metallique* of Laennec; but as I have now no doubt that it was that phenomenon which I attempted to describe, it is an additional proof that air, as well as fluid, was at that time contained in the left thoracic cavity. But if this were really the case, all the air must have subsequently been absorbed or removed. We know by the experiments of Nysten that large quantities of air are readily absorbed by the healthy pleura, but it is doubtful whether the morbid pleura possess that power, and we can easily imagine that the orifice of the bronchial sinus might be

so situate as to permit all the air to be expressed through it, as the thorax got more filled with secreted pus. The description of the circumscribed tumour, between the second and third ribs of the left side, as being emphysematous, and the rushing sound heard in it by the stethoscope, corresponding with the inspirations and expirations, might also be considered as evincing the presence of air in the tumour and chest beneath it, but of this I am very doubtful, for in the last days of her existence the tumour decreased in size, and fell and rose with each inspiration and expiration, and pressure upon it had too instantaneous and direct an effect in producing the sensation of a fluid rising in the windpipe, and coughing caused its protrusion too decidedly to operate through the intervention of an elastic fluid. Besides the sound of rushing might be equally produced by the flowing of a liquid, as of air, backward and forward through a narrow orifice.

The respiratory murmur, being puerile in the right side, was conformable to Laennec's observations; but some doubts may be entertained whether the respiration was really heard in the left side, except immediately under the clavicle, or along the spine. According to Laennec, a very trifling effusion is sufficient to render the respiration inaudible; but although I differ with great diffidence from the authority of one in whose accuracy of observation my confidence increases with my increase of experience, yet I cannot help believing that in other cases of empyema and effusion, besides this, the respiratory murmur of the respirable lung may have been heard, though indistinctly. Nor do I think it improbable that the sound of respiration may be conveyed along the ribs from one side to the other. But after all, there are evident sources of fallacy, and I and others may have been mistaken.

The displacement of the heart observed in this case I have since met with so constantly in empyema of the left side, that it may be considered as a pathognomonic symptom of a considerable degree of this disease.

As a counterpart to the case just related, in which there is reason to believe that empyema, complicated with pneumothorax, had been converted into simple empyema by the removal of the air, is a case which occurred to me before M. Laennec had made us intimately acquainted with the signs of these diseases.

Case IV.—*Simple Pneumothorax of the right side.*

A young man, pressman in a printing-office, consulted me on account of very copious pulmonic hæmorrhagy, which obliged him to discontinue his profession. In the course of some months he again came under my care with symptoms of phthisis pulmonalis in their most advanced stage. He could lie only on the

right side, and was threatened with suffocation if he turned on the left. Suddenly after his expectoration had been unusually copious, he could only lie on the left side, and instead of having the placid tranquillity of a phthisical patient, he became affected with excruciating pains, which he described as if his inside were tearing out, and referred particularly to his lumbar region. Death soon put a period to his agony; and in this case also the body, before being opened, exhibited some enlargement of the right side; but on trying it by percussion as it lay on the table, the right side was much more sonorous than the left, which led me to suppose that the right lung was more healthy than the left. On opening the body, however, we were surprised to find the right cavity of the chest of a very large size, and containing no fluid, but distended with air only, which indeed rushed forth as soon as the *pleura costalis* was divided. The diaphragm in this case also was concave towards the thorax, and we here found the right lung compressed against the mediastinum, and bound down by a thickened pleura pulmonalis, or false membrane, but we did not discover any fistulous opening through which matter could have escaped into the bronchia. Nevertheless, I have no doubt that this had been a case of empyema, and that, so long as the patient could lie only on his right side, that cavity had been filled with purulent matter, which, in the progress of the disease, had found its way into the bronchia and been discharged from the mouth, while air entering through the same passage into the cavity changed the disease into pneumothorax; after which the patient could only lie upon the left side, and experienced extreme suffering from sudden distension of the cavity and displacement of various viscera by the thrusting down of the right half of the diaphragm and liver.

The only other case of simple pneumothorax uncomplicated with empyema which I have seen, was that unique instance related by Dr O'Brien in the Edinburgh Medical Journal, Vol. xxiii. p. 412, in which it was produced by a rupture of the trachea by external violence.

Most commonly pneumothorax is complicated with empyema, and indeed depends upon its presence. Air may get into the cavity of the chest in various ways, but the two which are most obvious, and of both of which I have met with examples, are the entrance of the atmospheric air through an incision made for giving an exit to the pus in cases of empyema, and its entrance through a bronchial tube, by which a portion of the purulent fluid has escaped.

I shall relate the cases of pneumothorax complicated with empyema in the order in which they occurred, as they thus elu-

cidate the progress made in the diagnosis of the diseases by the extended application of percussion and auscultation.

Case V.—*Empyema with Pneumothorax of the Left Side.*

For the very minute and accurate history of this case I am also indebted to Dr Lane, who was at that time my clinical assistant. I have been unwilling to abridge it, because these diseases cannot be understood except by studying the symptoms in detail.

November 29th, 1820. John Tough, ætat. 24, sailor. Complains of cough, which is induced by change of position, especially on lying down and rising up out of bed, or when he sits down to rest after ascending a steep place, or generally on any hasty movement of the body. If he lies down carefully the cough does not come on at all. If he rises up carefully he has no cough in the act of moving, but coughs for about five minutes after being seated. The cough is occasionally followed by vomiting of clear water, which he ascribes to the violence of the cough. It is always accompanied by the expectoration of a clear tenacious fluid, of a salt taste, and so frothy that he compares it with soap suds. The vomiting relieves the cough, as does also the expectoration, which amounts in quantity to about two or three table spoonfuls at a time; the distance of time at which the cough occurs after expectoration being, he thinks, always in proportion to the quantity of fluid expectorated, unless brought on by some sudden change of position. The cough is always relieved by walking in the open air. He can take a full inspiration without hurried breathing; no dyspnœa at present; he lies while awake on his back, to avoid an uneasy sense of fulness in the stomach, which he almost always experiences on turning to the left side; he dozes sometimes on his back, but in order to sleep he turns himself on the left side, when, although the uneasy fulness is felt in the stomach and upper part of the belly, it is not sufficient to prevent him from sleeping; he dreams much, but seldom wakes in a fright, and he feels refreshed by sleep; no sense of suffocation. When he turns on his right side the cough becomes very violent, and he expectorates much larger quantities of the clear fluid before described at one time than he does during a whole day while lying on his left side. It then amounts to half a Scotch gill in five minutes, and pours from his mouth in a continuous stream. The uneasy fulness of the left side disappears when he turns to the right; when he turns to the right side slowly and carefully, and breathes with gentle and uniform respiration, the cough will not come on for ten or fifteen minutes, but if he speaks or breathes with the least quickness, cough is instanta-

neously induced, and the beat of the heart becomes stronger. While lying on the right side he feels universally relieved and refreshed until the cough comes on.

He reports that, upon any sudden or considerable movement of the body, he is sensible of a distinct fluctuation in the left cavity of the thorax. When he moves his chest from before backwards, it seems to move alternately against the breast and back-bone, and when from side to side, he feels it chiefly against his shoulders. By making these movements he can at any time render the fluctuation audible to himself and to bystanders. The fluctuation is distinctly felt by the fingers placed in the intercostal spaces, the opposite side of the chest being at the same time struck; it is also felt by the hand pressed against the diaphragm beneath the ensiform cartilage when he takes several short breaths in succession, and is then accompanied by a distinct sense of fluid moving in the chest. The left side of the chest, which is emaciated, is somewhat deformed, and the intercostal spaces enlarged.

The lateral bulging of the ribs is greater at the lower part of the left than of the right side, so that the spine does not appear to be in the centre. The action of the intercostal muscles, which is seen in the back on the right side, is not observable on the left. The movement of the right side of the chest is much more conspicuous than that of the left. On percussion the left side is sonorous above, and gives a dull sound at the lower part. The right side is everywhere sonorous. Respiration is inaudible along the whole posterior and anterior part of the left side of the chest, except very slightly beneath the left clavicle, and under the axilla. It is distinctly heard in all parts of the right lung.

The pulsation of the heart is not felt at all in the præcordium; very indistinctly in the epigastrium and right hypochondrium, but it is felt with great distinctness at the right mamma, conveying there the same kind of sensation that it does when the apex is situated in its proper place. The double beat of the heart is heard at the right mamma, the pulse at the wrist corresponding to the second beat.

When he passes his water, which is accompanied with much flatus, the fulness of the stomach is much relieved. He occasionally, but very seldom, has pain at the pit of the stomach, but he can at any time bring it on by stretching himself in bed. The pain is as if something crushed the painful part, and when he stretches, it is much increased by pressing the pit of the stomach. Some pain in the right hypochondrium, increased on pressure.

There is an abscess on the margin of the anus; Pulse 90, rather weak; heat and respiration natural; tongue foul, with

occasional bad taste; much thirst; skin cool; appetite keen; bowels open; urine scanty, and passed in very small quantities at a time, with some pain.

He reports that a dry cough came on in March last, and was very violent until eight weeks ago, since which it has gradually abated. From the time his cough came on he lost appetite, strength, and flesh continually, and he was confined to his bed in August. Up to that time he felt constantly inactive and dull, with much inclination to sleep. In August he was seized with an acute pain, which extended over the whole of the left side of the breast and to the left shoulder, attended by shiverings that were followed by sweating. There was also pain at the breast-bone, but he does not remember that the coughing increased during the continuance of these pains. They lasted for four or five weeks, and about a fortnight after their disappearance he first heard the fluctuation in his breast as he was kneeling down to tie his shoe, and it continued to become more evident till about a fortnight ago, since which the fluctuation has been less considerable, as if the fluid was decreased. He remembers that his heart was formerly in the left side, but he cannot tell when he first observed its situation changed.

About fourteen weeks ago, (at the time he had the acute pain in his chest,) he recollects to have felt a violent palpitation at the pit of the stomach, which lasted for a week, and since that time he made no observation as to the position of the heart, until he felt it in its present situation. He has tried a variety of medicines without benefit; enjoyed very good health before the commencement of his cough, which he ascribes to being wet through, without changing his clothes.

It is sufficient to make a few extracts from the reports of this case, which are fully detailed in the Journal. On the 18th December it is reported that a large portion of the left side of the chest is sonorous on percussion; respiration is audible for an inch below the nipple in the erect posture, and the sound of agitated fluid is very distinct when he jerks his body. On the 22d, respiration has become quite audible in all parts of the left side of the thorax anteriorly, except at the lowest part, and is very sonorous. On the 28th he had increased palpitation for an hour yesterday, and the pulsation is felt most distinctly an inch below the right mamma; says he has a loud wheezing noise occasionally in the right lung. 31st, Respiration now heard over a great part of the left side of the chest. When he lies upon his back the anterior part of the left side is much more sonorous on percussion than natural, and the posterior part is quite dull; but when he sits up and bends forward the anterior part

becomes quite dull. January 5th, Thinks he coughs more on the left side than formerly. The last report is on the 12th of January. By examination with the stethoscope there is evident pectoriloquism in the upper part of both lungs, and by applying the finger above the clavicle when he is laid upon his back he can, by agitating his body, render fluctuation perceptible to the touch.

He had for some time been anxious to return to his native place, Hull, and being still able to walk about, he took advantage of a vessel going from Leith to that port to return home. Through the good offices of Dr Conolly, then a clinical pupil, I am enabled to complete the history of this interesting case, by the communication of an account of the appearances on dissection, which was performed by Robert Craven Junior, Esq. Vice-President of the Hull Medical and Chirurgical Society.

"On the evening of 3d April 1821, the day following his death, I inspected the body in the presence of my father and some other medical gentlemen. On opening the thorax the *pleura costalis* was so adherent as scarcely to be separated; the left cavity contained about three quarts of serum, which was taken away, when several ounces, say six or seven, of pus were found at the bottom towards the diaphragm. The lung on that side was reduced to about $\frac{1}{20}$th its natural size; there was merely a small portion at the upper part of the cavity, on the surface of which the pleura was condensed and very much thickened; it was firmly adherent to the *pleura costalis* by a semicartilaginous structure, to detach which I was obliged to use the scalpel.

"The *pleura costalis* was also very much thickened and condensed, and had in many places patches of coagulable lymph, which had become organized. In the right cavity there was no fluid, but the lung was beset with tubercles, and had partial adhesions, which appeared to be recent.

"The heart was small, but without any evidence of disease; it was displaced and lay under, and somewhat to the right of the sternum; no fluid in the pericardium.

"The abdominal viscera were also examined; the mesenteric glands were considerably enlarged; and there were partial ulcerations of the mucous coat of the jejunum and ileum."

The next example which occurred to me was that of Mrs Craig, which I have already published in the Medico-Chirurgical Transactions of Edinburgh, Vol. i. p. 455. The case was remarkable on account of the air not being confined within the cavity of the pleura, but forming on the chest several distinct external emphysematous tumours, illustrative of the tumour whose nature was obscure in Mrs Neilson; and on account of its pro-

gress being the reverse of that which is the most common. The disease having commenced in the parietes of the chest, the pus eroded the *pleura costalis*, entered the cavity, excited chronic pleuritis, and at last found an exit through the lungs by a bronchial tube, establishing a communication between the aerial passages and the external tumours.

Case VI.—*Empyema of the left side terminating favourably after operation.*

Mary Mulrean, aged 8, was admitted into Queensberry Hospital, September 1822, with severe pulmonic inflammation, for which she was bled and blistered, but was removed from the hospital not much relieved. Her pectoral affection became much worse, and was attended with most acute pain. After some time I was consulted. She was now very much distressed, and could breathe only when lying on the left side. The left hypochondrium was generally enlarged, and there was a circumscribed tumour about the size of an egg projecting between the second and third rib in a line with the nipple. This tumour was punctured by Mr Cumming, who then attended her. At the time of the puncture only the pus external to the ribs was discharged, but when laid in bed a copious discharge took place, and when she coughed, it flowed from the orifice in a large stream. A phlegmonic tumour afterwards appeared on the same side at the ninth rib, which was opened by Dr Duffin. This did not discharge freely like the former, but occasionally closed and opened again, and sometimes both orifices were discharging at once. She now became hectic, and her recovery was despaired of. Notwithstanding the abundance of the external discharge she was often like to suffocate from internal oppression. The pus at last seemed to make its way into a bronchial tube. She spat up whole cupfuls of thick pus at a time; and after this she rapidly recovered her health, and is now a stout young woman. For a long time after her recovery, there was a considerable depression of the upper and anterior part of the left side, and the thorax was not symmetrical; the mesial line of the sternum inclined to the right, and the spine to the left. Now the chest is equally elevated on both sides, and there is little deficiency of symmetry.

Case VII.—*Empyema converted into Pneumothorax by operation.*

Mr N. a student of medicine, was seized, after much exposure to cold in the dissecting-room, in the end of 1824, with what was considered as pleurodyne of the left side. When I first saw him he was bedfast, and complained only of pain in

the left side and shoulder, without cough or expectoration. He had also hectic fever. The first symptom which indicated the true nature of the disease was the total immobility of the left side during respiration, and the displacement of the heart, the two auricles of which could be distinctly seen pulsating on each side of the upper part of the sternum. The diagnosis was confirmed by the obscurity of sound elicited by percussion, and the absence of the respiratory murmur in the lower portion of the left side. After consultation with my friend Dr Abercrombie, it was resolved to perform the operation of *paracentesis thoracis*, and to complete the removal of the pus by means of a syringe. The operation was performed by Dr Ballingall, and was attended with some difficulty, on account of the very narrow space between the ribs. The quantity of pus which issued spontaneously was considerable, and much was drawn off by the syringe, in all three or four pounds. The syringe was afterwards repeatedly employed at intervals. He derived very great relief from the operation; but notwithstanding every precaution, as the lung did rise to occupy the space of the pus, air entered by the orifice, and converted the case from empyema into pneumothorax. The diseased side now became partially morbidly resonant on percussion, and the *tintement metallique* was distinctly audible. The wound continued to discharge for some time, but at length closed. His breathing having then become more difficult, another opening was made some weeks after the first, when several pounds were again drawn off with considerable relief. After long suffering he died exhausted and hectic, about ten months after the first operation, and the only symptom worthy of notice was that, towards the close, the muscles on the right side of the neck acted most powerfully during inspiration, in the manner pointed out by Magendie.

The body was examined in the presence of Dr Abercrombie and many other professional gentlemen, and I am indebted to Mr Watson, Fellow of the Royal College of Surgeons, for a sketch of the appearances when the thorax was opened. The sternum was left *in situ*, and the ribs on each side laid back by dividing their sternal cartilages, &c. and breaking them across about their middle. The pericardium, of large size, was seen projecting nearly equally to both sides of the sternum, the upper portion to its right, and the lower to its left. On this side it was covered and bound down by a dense adventitious membrane, which had prevented its resuming its natural situation, when the pus was partially removed. A similar membrane covered the pleura of the diaphragm and ribs. Rather more respirable lung than is usual in such cases, consisting of the upper lobe, appeared at the upper part of the left side, where its

adhesions were general. The lower lobe was bound down upon the mediastinum, and by far the larger portion of the cavity of the left pleura was filled with air and purulent matter, of which a considerable quantity still remained. The lungs of both sides when cut into were perfectly healthy. No bronchial communication was suspected, as the patient had never expectorated pus.

Case VIII.—*Pneumothorax with Empyema of the left side.*

The following case is remarkable on account of the short time in which it proved fatal, and on account of its true nature not having been discovered until a few days before death, although the severity of the symptoms made the patient an object of unremitting attention.

Bell Hood, æt. 25, admitted into the hospital 13th Dec. 1826. Complains of acute pain in the right hypochondriac region, under the false ribs, shooting backwards, with exquisite tenderness on the slightest pressure; some cough, readily excited by motion and full inspiration; which, as well as the erect posture, greatly aggravate the pain of side; expectoration scanty and rather difficult; some pain of throat, with redness of fauces, and considerable hoarseness; respiration short and frequent; countenance anxious and flushed; occasional fits of vomiting, which are much excited by drinking cold liquids; tongue foul and moist; pulse 130, full and rather sharp; state of surface of the skin variable; heat moderate; bowels very confined.

States that six weeks ago she was first affected with a slight degree of pain in the right hypochondrium, which has been gradually increasing in severity; sore throat supervened a fortnight ago; has had frequent severe rigors; has not been bled; and has used no medicine.

14th.—Twenty-two ounces of very buffy blood were yesterday evening drawn from a vein; this produced a feeling of faintness with relief to the pain, which, however, returned in two hours Twenty-four leeches were then applied to the side, and the pain is now referred to the epigastrium, with tenderness of the scrobiculus cordis; respiration short and frequent; and she moves both the ribs and abdominal muscles; respiratory murmur heard with difficulty on the right side, and is puerile in the left side; lies only on the left side; has short suppressed cough, with little expectoration; the sputa are colourless, clear, and tenacious; pulse very frequent, 130 and upwards, and difficultly reckoned; tongue clean; bowels open.

Twenty-four leeches were directed to be applied to the epi-

gastrium, and afterwards cataplasms; the opiate linctus to be taken when the cough was troublesome.

15th.—Leeches gave great relief; had three scanty lumpy dark-coloured stools from a compound jalap powder, with some tenesmus; had slight vomiting during the night, but slept well without return of pain until about five hours ago, and it is still very slight without tenderness; countenance and respiration improved; pulse 134, firmer, and soft; tongue nearly natural; great thirst; urine high-coloured.

A purgative clyster was ordered; the linctus continued; and acid drink at pleasure.

16th.—The injection operated twice, and produced dark lumpy stools; became delirious during the afternoon; got a camphor draught, which composed her until about 2 A. M., since which time she has walked the ward and changed her bed from uneasiness and restlessness, but she asserts that she was all the while quite conscious. She now complains of great pain in the right hypochondrium and right side of the chest; respirations are 48 in the minute; slight cough; pulse 144, very weak and irregular; tongue clean.

She was ordered to take the camphor draught immediately, and again at 9 P. M. and at 3 A. M., if necessary. A purgative clyster was to be immediately administered, and tartar emetic ointment to be rubbed on the side.

17th.—At eight o'clock yesterday evening the difficulty of breathing and general distress were greatly increased, with excessive irritability, and the pulse about 160. A turpentine clyster was administered, and an anodyne draught given, after which she became more composed, and her breathing easier; a very scanty evacuation followed the clyster.

During the night she is reported to have talked incoherently, but her mind is now quite correct; respirations 48 and laborious; larger on the left than on the right side of the chest. When she lies on the back the right side is more sonorous on percussion than on the left. When the stethoscope is applied to the right side no respiratory murmur is heard, but in the left it is very audible and puerile. When sitting up and the naked ear applied to the chest, mucous rattle is heard in the left side, and occasionally in the right, alternating, if I mistake not, with *tintement metallique*, chiefly when she first sits up, but not rendered more certain by coughing or speech. Cough more troublesome, and there is very audible mucous rattle. Expectoration difficult from inability to get up the sputa, although she has strength to sit up in bed.

She was ordered to inhale steam, to take small doses of ipecacuanha frequently, and to continue the tartar emetic frictions.

18th.—Continued sensible for about an hour after the visit, when she became delirious, and continued so until 5 P. M. She then got out of bed, walked a few paces across the ward, but was obliged to be carried back from sudden weakness of the lower extremities, and she died almost imperceptibly soon after she was laid in bed.

The body was examined next day. On percussion, the right side of the chest was much more sonorous than the left, but no difference in their size or form was perceptible. The body was very fat. When the abdominal parietes were turned back, the liver came fully into view, enlarged and thrust down below the lower edge of the ribs. There was no effusion, inflammation, or other disease of the abdominal viscera. From the abdomen the left half of the diaphragm was felt to have its usual form; but the right half was convex downwards, and to the touch was elastic, and seemed to confine air in the chest.

The left side of the thorax was first opened; the lung collapsed, and nothing preternatural was observed; but on prosecuting the examination a rush of air, without fetor, took place from the right side of the thorax; and on removing the sternum, the right cavity, greatly enlarged by the descent of the diaphragm, was nearly empty, containing only twenty-two ounces of sero-purulent fluid, and apparently no lung. The whole cavity was lined with coagulable lymph, of a primrose colour, and varying very much in thickness. It was thinnest on the lateral costal pleura, but became thicker as it approached the spine and diaphragm, and it covered what appeared to be the mediastinum with a thick layer, from which massive bands stretched across the cavity to the diaphragm and lower portion of the costal pleura. It was of a soft consistence, and in no degree organized or penetrated by blood-vessels from the contiguous pleura, which was in general highly vascular.

The left lung and heart were now removed, the trachea cut across, and the mediastinum with all that adhered to it, and a portion of the right diaphragm, carefully dissected out. It was now quite evident that the right lung was concealed behind the thick layer of coagulable lymph, which seemed to cover the mediastinum, but bound the lung down upon it. The lung was compressed into a flat mass with thin edges, about six inches long and three and a half broad, and about one or one and a half thick. Its lobes were glued together, as was the mediastinal surface, slightly to the mediastinum, but without any interposed lymph. The substance of the lung felt doughy, but did not retain the impression of the finger. To ascertain whether its surface was entire the lung was wholly immersed in water, and air was blown into the trachea after the left bronchial branch was secured, upon

which bubbles escaped readily through the coagulable lymph from a single orifice on the lateral surface of the lung, and about an inch from its dorsal edge. This orifice was about one-eighth of an inch in diameter, and led into a very small superficial cavity, not lined by any membrane, or communicating with a visible bronchial tube, but as if formed by the breaking down of a small portion of the lung, laying open a number of air-cells through which air could be blown from the trachea. The lung itself was somewhat condensed, but swam in water, and could be inflated in a very slight degree only. On cutting into it no great deviation from the healthy texture was observed, and it contained no tubercles.

The left lung, except a few old adhesions, was perfectly healthy, and the heart was natural in size, structure, and the distension of its cavities. Fibrinous polypi, very firmly attached to both ventricles, stretched into the aorta and pulmonary artery.

Very little blood escaped during the dissection.

Case IX.—*Pneumothorax and Empyema of the right side with partial adhesion.*

Elizabeth Reid, aged 37, was admitted into the clinical ward on 22d February 1827, under the care of my colleague Dr Graham.

Countenance rather sallow and depressed; complains of general debility and languor, with sense of heat; feels some pain in the course of the œsophagus downwards to the middle of the sternum, coming on every day about twelve, and continuing till the following morning, preventing sleep, and with the general pains around her body, rendering the same position irksome and uneasy when continued in for more than ten minutes. There is some hardness in the epigastrium and right hypochondriac regions; and in the umbilical region a slightly elevated tumour is perceptible, touching which affects the respiration. Some cough, with scanty tough expectoration, and giving slight pain under the sternum.

Palpitations occur every night for about four or five hours, especially when lying on the left side. Anorexia great; the bowels slow; the last two stools observed to contain blood; tongue clean; pulse 116, small, weak, occasionally intermitting; urine very high-coloured, and at times difficulty in voiding it; has got no sleep for the last fortnight.

Says, that for the last twelve years she has been much troubled with a complaint in her stomach, having two or three times a-week for that period had vomiting of greenish yellow matter after any unusual exertion, each attack lasting about

twenty-four hours, but had no pain except in her right shoulder (which she attributed to a strain got about a month since) till twelve days ago, when this pain was much increased; and she was also attacked with severe rigors, general pains, and soreness, with great thirst, and vomiting of bile, for which she was bled the same night to about (she says) three quarts, or thirteen cups, with instant relief. A blister was afterwards applied to the right hypochondrium, not because the pain was more severe there than elsewhere, but because it was said by the practitioner who attended her to be the seat of the disease. The feeling of burning in the chest came on about a week ago, the other symptoms having abated, and debility only remaining.

On the 15th March it is noticed that the ribs on the right side of the chest were less movable in inspiration than those on the left, and the sound on the right by percussion dull. At this time the cough was very troublesome, and the expectoration much increased. Coughing also gave a sensation of rawness within the chest.

On the 16th the impulse of the heart was distinctly perceived by the stethoscope on the right side of the chest below the mamma, and from that point upwards in a line to the axilla; the respiration dull and indistinct near to the clavicle, and in most parts of the right side behind inaudible; dyspnœa and cough are increased when lying on the right side; lies pretty easily on her back; tongue florid, with a few aphthæ. Next day the cough is described as more severe, and the expectoration much more copious, yellow, partly flocculent, and partly diffusible through water; complains much of shooting pain below the right axilla, increased by lying on the right side, and going off occasionally when turning to the left.

On the 18th it is reported that during the preceding night she had been able to lie for about an hour on the *right* side without pain or cough, which she had not been able to do since she was taken ill. For some days after this her expectoration continued to be copious and then abated.

I took charge of the female clinical ward in the beginning of May 1827. The nature of the disease was so completely ascertained, and the patient so infirm, that it was not thought necessary to subject her to the distress of renewed and repeated minute examinations. At that time she was very greatly emaciated; had hectic fever; mouth and tongue aphthous, with frequent diarrhœa; very great dyspnœa, most comfortable in the erect position, and able to lie down only on the *right* side, any other position causing pain at the inferior part of the left side; started much during her sleep, but was no longer sen-

sible of fluctuation in her chest; full inspiration prevented by causing pain in the right hypochondrium; cough generally slight, and sputum sometimes offensive; had often a sense of constriction along the anterior edge of the diaphragm, occasionally of something rising in her chest, and after deglutition felt as if an obstacle prevented the descent of the food into her stomach. The right side was generally dull on percussion, and the respiratory murmur was inaudible at its lower part; the left side of the chest seemed preternaturally sonorous on percussion.

In this hopeless case the treatment was chiefly directed to mitigate painful sensations, and to check the diarrhœa, which was rapidly reducing the strength of the patient.

She gradually sunk, and expired on the 10th June. The body was examined next day with great attention by Dr Cullen, one of the surgeons of the hospital, and I had the assistance of my colleagues, Dr Graham and Dr Alison, in remarking the morbid changes, which were noted down at the time by Dr William Fleming, to whose division of the clinical ward the patient belonged.

Externally the right side of the chest appeared larger than the left, and the sixth, seventh, and eighth ribs of the latter were rather depressed. The superior part of the left side corresponding to the second rib was more sonorous than the same part of the right side, but inferiorly the right side gave a clearer sound on percussion. The ribs were everywhere more prominent than the intercostal spaces. On opening the abdomen no protrusion of the diaphragm downwards was perceived. The cartilages of the ribs were exceedingly strong. There was no air in the cavity of the left pleura. Its lung was lighter in colour than usual, and collapsed upon the admission of air. There were strong adhesions at the upper lobe of this lung, and in the superior part a tubercle, with a small cavity corresponding to the point where the adhesion was strongest. The remaining portion of the lung was healthy, and not tuberculous. The pericardium was in its natural situation. The bronchial glands were slightly melanosed.

Upon making a puncture between the first and second rib of the right side, no air escaped, nor did the lung collapse, being prevented by the strong adhesions of its whole upper portion to the mediastinum and ribs. Upon puncturing the inferior part of the same side some air escaped, and a considerable cavity, extending from the diaphragm almost to the second rib, was discovered, containing an effusion of sero-purulent fluid, the lung being forced upwards, and compressed by the accumulation of pus, of which there was about two pounds. It exceedingly resembled the pus of a common abscess, containing no

flakes of lymph. Upon blowing into the bronchial tubes some air appeared to escape from that part of the compressed lung, which corresponded to the intercostal space between the second and third rib. The right lung was spongy, crepitous, and less condensed than might have been expected from its diminished size. It was not tubercular. It floated upon water even with its false membrane attached. The pleura of the right side, especially anterior to the angles of the false ribs, appeared very unhealthy, as if the effused lymph had been organized, and not terminating in simple adhesion, but becoming granular, had ulcerated, assuming the appearance of a common ulcer on the leg after death, *viz.* fleshy, vascular, and irregular. The false membrane of organized lymph was evidently vascular, was external to the pleura of the lung, easily separable, leaving the pleura of healthy appearance. The ulcerations as above described on the right side communicated freely with each other, forming sinuses, and had destroyed the continuity of the pleura, but the bone opposed was not carious.

There are some peculiarities in this case deserving of notice. It is by no means certain when the pleuritis, which gave rise to so great organic changes, commenced; or more specifically, whether the false membrane had begun to be formed twelve years or twelve days, or rather a month before admission, when she had pain in the right shoulder attributed to a sprain. The history of the symptoms is in favour of the latter supposition. It was then that she first experienced severe rigors, general pains, and soreness, and other decided symptoms of acute inflammatory affection. During the longer period, the stomach and liver seemed to be the only organs implicated. But, on the other hand, the thickness and cartilaginous hardness of the false membrane, and its being apparently ulcerated as a secondary disease, are scarcely compatible with the idea of its being the consequence of an inflammation which took place only four months before death. The manner in which the paroxysms of vomiting were excited by unusual exertion rather suggested the idea of an organic affection than of simply diseased function; and we can conceive that the functions of the stomach might be deranged by sympathy, when by unusual exertion a diseased lung was called into excessive action, while the absence of all pulmonic symptoms has been repeatedly observed in cases where false membranes have been found on the pleura. It is not improbable, then, that pleuritis had existed in a chronic state for twelve years, and was called into activity by the sprain, as it had all along been exasperated by unusual exertion.

Another curious circumstance was the daily recurring sense

of heat in the course of the œsophagus, noticed at the time of her admission, and which from time to time was the symptom most complained of to the termination of her life. I regret that the morbid state of the pleura should have exclusively engaged my attention, and that I made no observations, or at least preserved no notes of the state of the œsophagus and stomach, to which so many symptoms in the course of her illness were referred. I notice this to put others on their guard against such negligence.

Until the 18th March she could not lie at all on the right, the diseased, side without pain or cough being induced. When she became my patient on the 1st of February she could lie only on the right side. At the time when this change took place her expectoration, till then scanty, became more copious. Now, if we suppose that at this time the effused fluid first found its way into a bronchial tube, the disease was then converted from empyema into pneumothorax, but the change of decubitus is exactly the reverse of what it ought to have been; for in empyema the patients commonly lie on the affected, and in pneumothorax on the sound side. It may, however, be remarked, that the reason why she could not lie on the sound or left side during the latter period of her disease was not increased difficulty of respiration, but pain induced in the left side from that position.

This case also illustrates the modifications of the signs of percussion and respiration, in consequence of adhesions.

Case X.—*Pneumothorax and Empyema of the left side.*

The last of this series of cases occurred soon after the preceding.

Margaret MacCromby, æt. 32, admitted July 13, 1827. Has very intense dyspnœa, obliging her to lie with the head much raised; totally preventing decubitus on either side, and frequently amounting to complete orthopnœa; the respirations are much accelerated; at present 50 in the minute; the left ribs are little if at all elevated during inspiration; she has some cough, with scanty, very difficult expectoration, often causing retching; experiences much pain in the posterior part of the left side of the chest, extending over the shoulder down the arm to the elbow. There is increased heat of the integuments of these parts, with tenderness on pressure; has much palpitation; perspires very profusely during the night; and has severe diarrhœa; pulse 136, sharp; great thirst.

The sound on percussion is very obscure over the whole left side of the chest, as well anteriorly as posteriorly, except beneath the clavicle, for two or three inches, where it is preterna-

turally clear and sonorous. On the right side it is natural; no respiratory murmur can be perceived in any part of the left side, excepting for a small space between the spine and scapula, where it is "bronchial." The "*tintement metallique*" is distinctly audible on sudden change of position, but not during coughing, respiration, or speaking; and on succussion of the trunk, the sound of fluctuation is evident. On the right side the murmur is distinct in the superior lobe, and obscure in the postero-inferior portion. Below the right clavicle the sound of the voice is loud, and seems almost to pass through the tube of the stethoscope (bronchophony?) The heart is much displaced; it pulsates most strongly near the right mamma, and between it and the sternum. On admeasurement very little difference can be discovered in the capacity of the two sides of the chest; nor are the left intercostal spaces at all prominent.

Fifteen months ago, after a tedious and severe labour, she was delivered of a still-born child (a leg presentation.) One month after she had considerable hæmoptysis, with much cough; relieved by venesection. During the last summer she continued delicate, but free from any pectoral complaints. In November last she had again slight hæmoptysis. In the winter the cough and pectoral complaints returned, being exacerbated by any casual exposure to cold. She had but little dyspnœa, and not much expectoration. Six weeks ago, after well-marked rigors, was suddenly seized with acute pain in the left side of the chest, urgent dyspnœa, and increase of the cough. She had also pain and tenderness of the back, left shoulder, and arm. These symptoms have all been rapidly increasing in severity; and she has at times expectorated large mouthfuls of purulent matter. But during the last three weeks the expectoration has been rather scanty; the diarrhœa and perspiration have supervened, with emaciation and general debility.

After admission she continued to get worse, and died on the 18th of July.

The body was examined next day with very great skill and attention by Dr Cullen, in the presence of Dr Alison, Dr Dalmas, many of the hospital pupils, and myself, and the appearances were carefully noted by Dr William Henry, to whom I am also indebted for the very accurate history of the case.

About ℥ii. of bloody serum were effused into the peritoneal cavity. The left side of the diaphragm formed an arch of great convexity, projecting into the abdomen, and forcing downwards the stomach and contiguous viscera.

The right side of the thorax was first opened. There were firm and pretty general adhesions between the costal and pulmonary pleuræ. The whole of the pericardium and its con-

tents were found on the right side of the median line. The apex of the heart was situated beneath the cartilages of the fifth or sixth ribs, near their union with the bone. The left pleura was carefully separated from its attachments to the cartilages and intercostal muscles, which were dissected back for a considerable extent, when it appeared as a large sac, elastic, and evidently distended with air, projecting far forwards and into the right side. A flexible tube was introduced, and a portion of air collected over water for analysis. About ℔ viii. of fœtid pus were then drawn off. Two fistulous communications between the bronchia and the cavity of the pleura having been previously detected by insufflation through the trachea, large and numerous bullæ of air ascended through the fluid. The lung was firmly bound down to the spine by an universal covering of dense lymph. Its tissue was much condensed, being no longer crepitous, and sinking readily in water. The lower fistulous aperture was traced obliquely under the adventitious membrane and pleura into a dilated bronchial tube, of which it was evidently the termination.

At the most depending part of the anterior portion of this lung, the false membrane by which it was invested presented several depressions of irregular form, with indented margins, apparently the product of ulceration. Some of these were bounded by the pleura, but others had pierced this membrane, and had penetrated to various depths the pulmonary tissue, which was soft and pultaceous, with very fetid odour, resembling incipient gangrenous degeneration. The costal pleura, with its new membrane, also exhibited a similar diseased condition, chiefly between the angles of the ribs and the spine. In this situation were very many irregular depressions, giving to the surface somewhat of a reticulated appearance. At several of these points the pleura itself was penetrated, and the tendinous aponeurosis of the intercostal muscles exposed; but the ribs were no where denuded. The colour of those muscles was in some parts changed, and they appeared in a state of atrophy.

There was considerable serous engorgement of the right lung, which was soft and pulpy. There were no tubercular depositions in either lung.

Slight increased vascularity, but no ulceration of the mucous membrane of the small intestines.

The air obtained from the cavity of the chest was examined in the evening by Dr Henry and myself.

The volume of the mixed gases had been notably diminished by remaining some hours in contact with water. The presence of sulphuretted hydrogen in quantity was indicated by the blackening of carbonate of lead. One hundred parts wash-

ed with liquid potassa lost twenty-six parts, which were regarded as a mixture of carbonic acid and sulphuretted hydrogen. On the addition to the residuary gas of twenty-six measures of nitric oxide, no fumes or diminution of volume ensued. It was therefore inferred to be pure nitrogen.

In these two last cases, as well as in some of the others, though not so accurately observed, the false membrane had the appearance described by Laennec, as arising most commonly from hemorrhagic pleurisy, " une dureté particulière, une demi-transparence bleuàtre, et une commencemént d'organization fibreuse, ou analogue, à la souplesse près, à celles des cartilages," T. ii. p. 121. In none of these cases, however, which I observed, did I see any proof or reason for believing that the fluid originally effused was bloody Indeed, I have always considered the bloody effusion, which I have often met with in various cavities, not as the effect of an inflammatory action, but as an extravasation in the agonies of death. I the more readily distrust M. Laennec's opinion, as it is connected with an hypothesis ; viz. that the effusions which form the ordinary adhesions after acute pleurisy, and are convertible into serous membranes, are albuminous ; and that those which form cartilage are derived from the fibrine of the blood. But he has not supported this opinion by any direct chemical experiments proving the diversity of the nature of the effusions.

I think it highly probable that the false membrane, after it is formed, becomes organized, and is converted into a secreting surface, for in general it covers the whole of the pleura in the cavity where it exists, so completely, that the false membrane seems the only source of the sero-purulent fluid, with which it is gradually enormously distended.

It is also evidently susceptible of inflammation, at least of ulceration ; for in many places it was observed eroded as it were with small circular pits, sometimes shallow, and sometimes penetrating through the whole thickness of the false membrane. Occasionally these penetrating pits communicated with each other by sinuses or by a more extensive separation of the false membrane from the subjacent pleura ; but at other times the ulceration penetrated through the pleura itself. When this happened on the costal pleura, it sometimes gave rise to caries of the adjacent ribs, and to external tumours, of which examples occurred in some of the preceding cases ; but when it took place on the pulmonary pleura, a communication was at last formed with a bronchial tube, through which, according to the position of the body, part of the fluid escaped, or air entered.

After this membrane is formed and organized there is no hope of the lung again rising so as to fill the cavity, and the cure can only take place by the falling in of the side. How

far this can be assisted by operation is doubtful; but we have seen one case terminate in recovery, and another was materially relieved by diminishing the distension. At any rate, we have seen that the operation is attended with no inconvenience, and may at all times be safely tried even as a palliative means. The earlier the operation is performed the greater undoubtedly is the chance of success; and I regret that it was not had recourse to in the case of Hood, in whom the disease was of short standing, and the membrane was less dense than in other instances. But after the disease was fully recognized in this patient there was little hope of any advantage from treatment.

We have seen how often these diseases have existed for some time, even a very long time, without being detected, although when once suspected their diagnosis was always easy and certain. When indeed they exist on the left side, the change of the place where the heart is felt to pulsate is quite pathognomonic, and certain unusual feelings, which the patient often calls palpitation, indicate its commencement before it can be perceived by the medical attendant. When it occurs on the right side, the first symptoms are a sense of fulness, various affections of the stomach, and pains often referred to the hypochondriac or abdominal regions, so that the liver is not unfrequently considered to be the seat of the disease. When the effusion of fluid or the distension by air is very great, the racking pains are sometimes exquisite, and the side is enlarged by the displacement of the liver. In all cases of this kind the omission of examination by percussion and auscultation is a culpable neglect, as they never fail to ascertain the nature of the disease, and prevent the employment of unnecessary and hurtful remedies.

The mode of performing the mechanical actions of respiration is greatly altered in these diseases. It is obvious, that as soon as either of them is advanced so far as to render the diaphragm concave towards the thorax, and convex to the abdomen, the two halves of this muscle can no longer act similarly, and that the one-half becomes an antagonist to the other.

If the muscular fibres of the inverted half are capable of acting, their contraction will diminish the length of the thorax, and their relaxation increase it, so that were both sides to act simultaneously, the one side would be inspiring and the other expiring at the same moment. But it is more probable that in this morbid state they act alternately, (for muscles readily assume these variations in their catenated actions,) and that the one-half is contracting while the other is relaxing, and *vice versa*, so that inspiration and expiration take place in both sides of the chest at the same time. It is, however, still more probable that

when the disease is far advanced, the inverted side of the diaphragm does not act at all, but remains passive.

When the action of the diaphragm becomes disturbed, even the sound side of that muscle is less employed; and inspiration is chiefly performed by the cervical muscles of respiration, which elevate the whole chest. This was strikingly observable in Mr N. but it may be seen in every patient affected with empyema, especially as they generally respire only with one side. Indeed, it furnishes one of the most decisive diagnostic signs for those who are not habituated to the employment of percussion or ausculation. If the patient suspected to be thus affected be made to sit evenly upon a stool without a back, the increased elevation of the shoulder of the sound side contrasted with the absolute rest of the other leaves no doubt as to the existence of the disease.